

II.

Larval Crabs from Bermuda.¹

MARIE V. LABOUR.

Naturalist at the Plymouth Laboratory.

(Text-figures 1-19).

A certain number of crabs in berry were collected on the shore and their young hatched out in the laboratory of the Bermuda Biological Station. Also a few were taken in dredgings and hatched out and some megalopae were reared to young crabs. The larvae were not reared through series of stages or to the megalopae. It is however useful to describe these larvae, hitherto unknown, some of which show interesting features. A colored drawing was made from each zoea hatched from the egg and color notes are given here. A few breeding records were also noted.

PORTUNIDAE.

The zoea was hatched out from the eggs of *Portunus sayi* and *P. depressifrons*. The megalopa of *Portunus aniceps* was obtained from the plankton and reared to the young crab.

Both zoeae are typical portunids and so also was the megalopa.

Portunus sayi (Gibbes).

(Text-fig. 1).

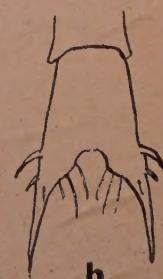
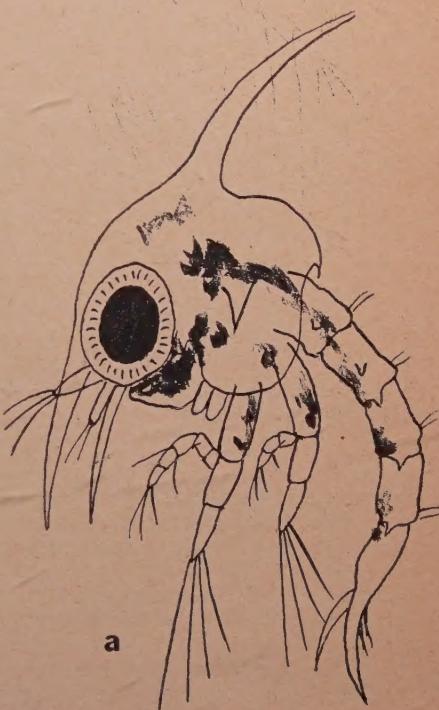
This species lives among floating *Sargassum* weed and is commonly found in the open water around Bermuda, sometimes drifting into the sheltered shallow bays in the Reach. It was found in berry from July to September. The eggs were 0.32 mm. across when nearly ready to hatch and were hatched July 1, 1938. The first zoea measured 1.2 mm. in length (from the front of the head region to the tips of the telson spines.) The body has a faint purplish-pink tinge and there are black chromatophores in the mouth region, in the thorax and abdomen and on the maxillipeds.

Portunus depressifrons (Stimpson).

(Text-fig. 2).

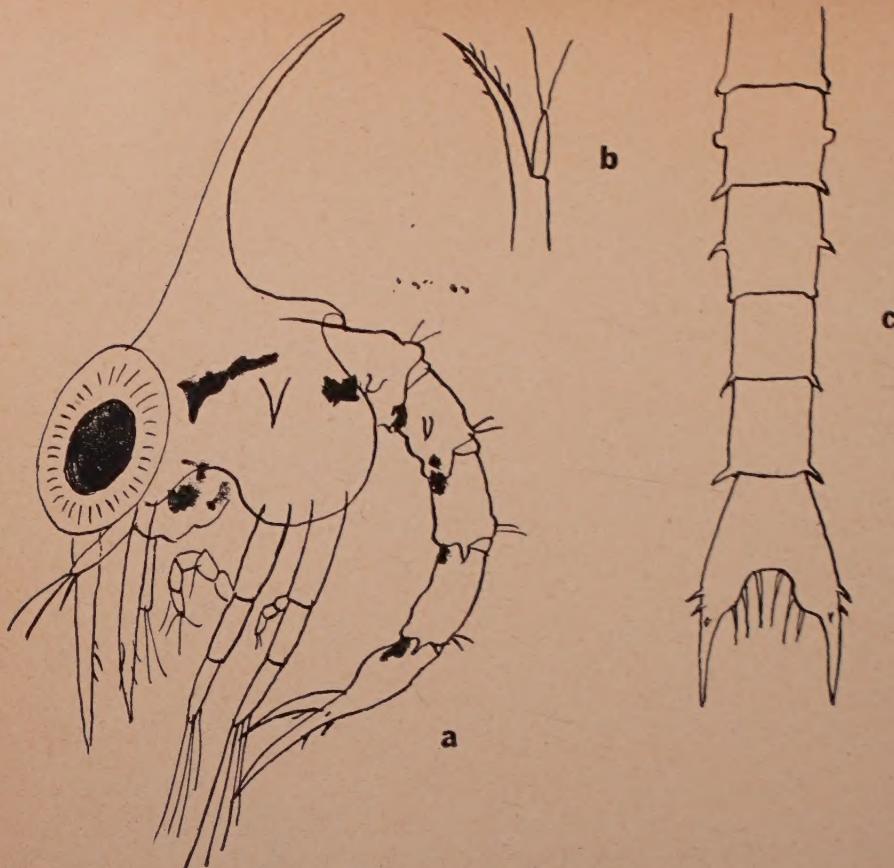
This species is very commonly dredged from sand in shallow water in the Reach, obtained by pushing a hand net. In

dredgings taken in July and August, 1938, it was not breeding but in April, 1939, several were in berry and the zoeae were



TEXT-FIG. 1. *Portunus sayi*. a. Side view of first zoea, 1.2 mm. long. b. Telson.

¹ Contribution, Bermuda Biological Station for Research, Inc.



TEXT-FIG. 2. *Portunus depressifrons*. a. Side view of first zoea, 1.6 mm. long. b. Antenna. c. Abdomen and telson.

hatched on April 23. The eggs measured 0.36 mm. across when ready to hatch. They have a pinkish color in the early stages and are dark brown later. The first zoea measures 1.6 mm. in length. The lateral spines on the telson are very small, especially the posterior spine. The body is very transparent and colorless with concentrated black chromatophores in the mandibular region, in the center of the thorax and on the abdominal somites.

***Portunus anceps* (Saussure).**
(Text-fig. 3).

This species is not common, but a megalopa was taken in the plankton from a night haul in the Reach, June 18, 1938, which changed to a crab. This and other species were kindly named by Professor Garstang.

The megalopa was large, the cast skin measuring 7 mm. long from the tip of the rostrum to the end of the telson. When living it was pale greenish-yellow with a very few dark chromatophores. The uropods bear 16 setae. The rostrum is long and straight.

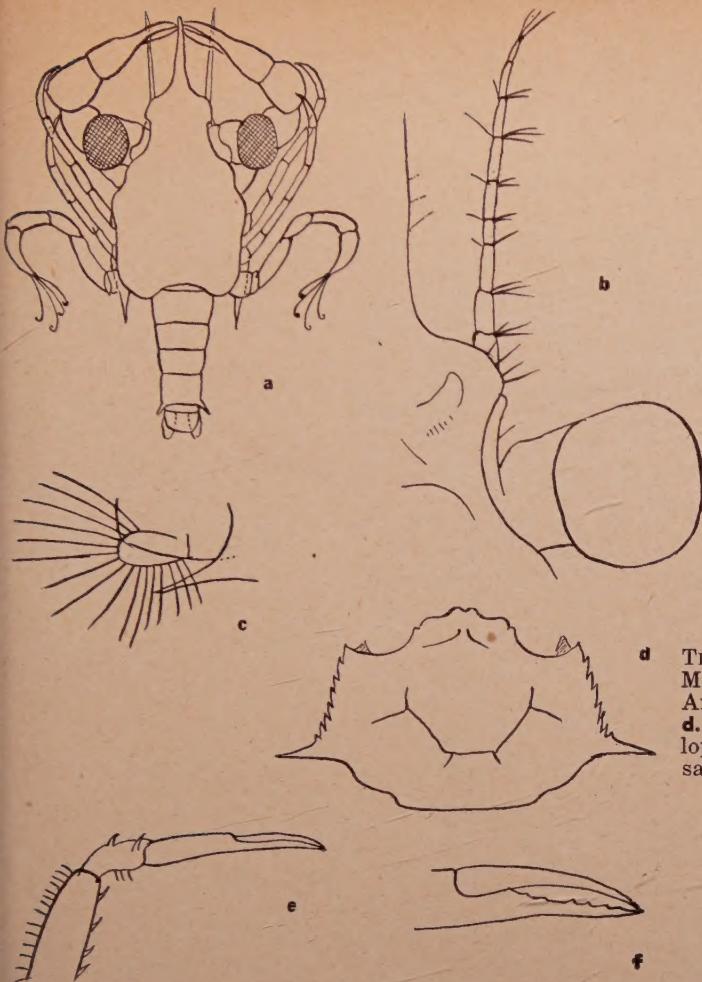
The first crab stage from the megalopa was pale yellowish with very powerful paddles. Unfortunately it died in casting its skin to the second crab stage. The carapace measured 6 mm. across with a very long lateral spine and 8 teeth in front of it.

GRAPSIDAE.

The zoeae of *Planes minutus*, *Pachygrapsus transversus* and *Percnon gibbesii* were hatched from the egg. *Planes* and *Pachygrapsus* are typical grapsids, but *Percnon* belonging to the *Plagusinae*, has some interesting and peculiar features.

***Planes minutus* (L.).**
(Text-fig. 4).

The zoea of this little *Sargassum* Crab has been described by Hyman (1924), who hatched it from the egg. It is extremely common in the *Sargassum* weed all round Bermuda and was breeding freely from June to October and from March to June occasionally in other months, so that there is hardly a month in which it cannot be



TEXT-FIG. 3. *Portunus aniceps*. a. Megalopa, cast skin, 7 mm. long. b. Anterior end. c. Telson and uropod. d. Carapace of first crab from megalopa. e. End of first leg. f. Chela of same.

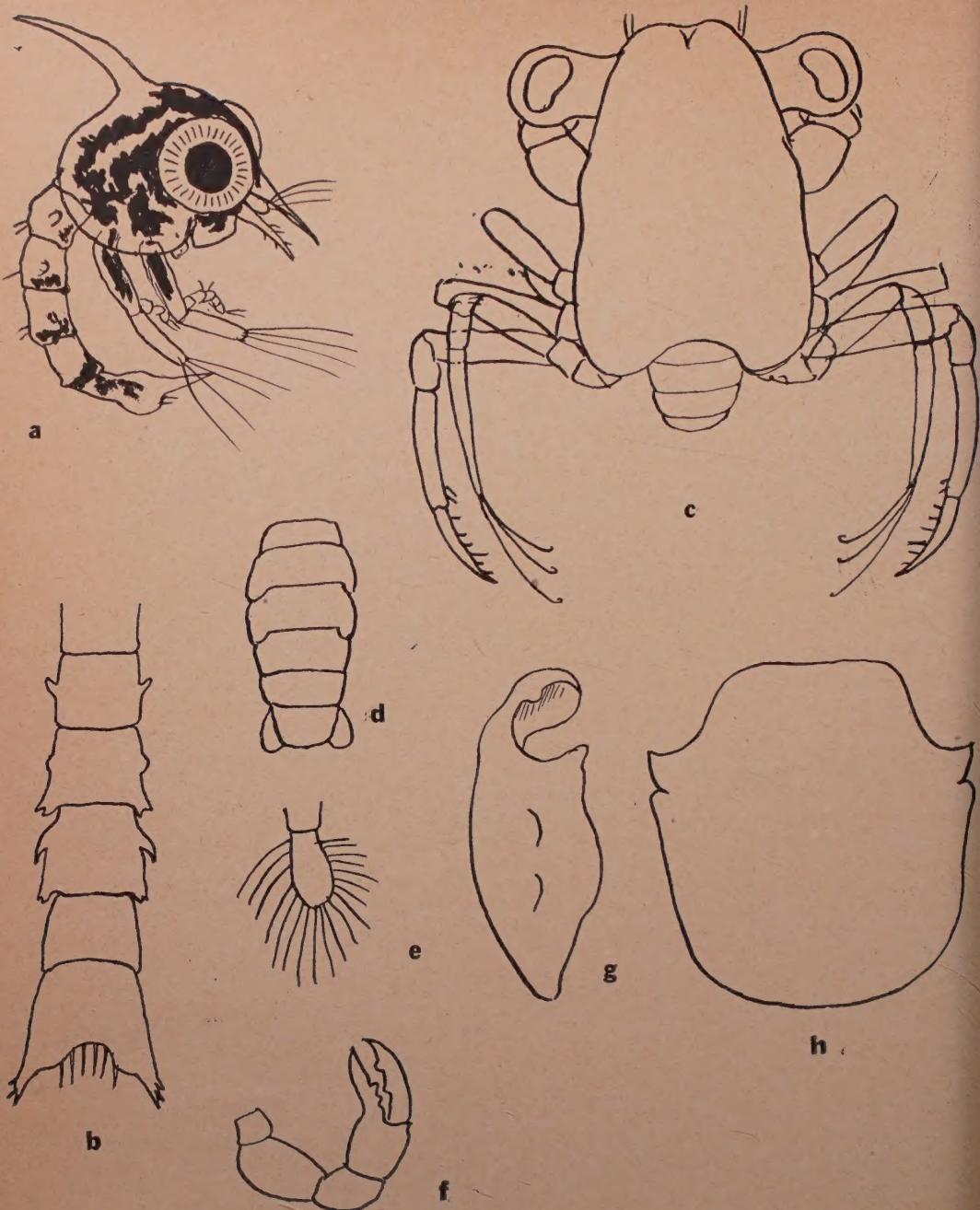
found in berry. The eggs were hatched out on June 13, 1938, and several times afterwards. They are dark brown in the mass, and measure 0.36 mm. across when nearly ready to hatch. The first zoea, 1 mm. in length, has much black pigment thickly spread on the thorax and in patches on the abdomen, the whole body being a very pale yellow so that the appearance is greenish. There are no lateral spines on the carapace and the dorsal spine is slightly longer than the rostral, both being short. There are forwardly directed knobs on the second abdominal somite, outwardly directed knobs on the third and backwardly directed knobs on the fourth. The third and fourth somite end postero-laterally in a process with 2 teeth. This is slightly different from Hyman's description and figure. The telson ends in a fork only slightly widened posteriorly with 3 teeth externally at the end of the forks and 6 long spines in the center. The antenna is a simple long process with spinules along its distal two-thirds and a minute pro-

cess representing the exopod which bears a single hair. The megalopa is common in the plankton, and is greenish spotted with pink chromatophores, the carapace measuring 4 mm. in length. Thus it is large compared with the first zoea. The fifth pair of legs end in 3 long feelers. The front of the carapace bends down as a rounded process. There is no true rostrum and there are no spines on the carapace. The uropods bear 19 spines. The first young crab from the megalopa measures 4 mm. across the carapace. It is very like the adult.

Pachygrapsus transversus (Gibbes).

(Text-fig. 5).

This species is very common under stones on the shore above high water mark, sometimes in the water slightly lower down. All along the Reach and along the south shore of Long Bird Island it is abundant. It breeds from April to October. The eggs measured 0.28 mm. across and were hatched June 25, 1938, and later. The first zoea



TEXT-FIG. 4. *Planes minutus*. a. Side view of first zoea, 1.1 mm. long. b. Abdomen and telson. c. Cast skin of megalopa, carapace 4 mm. long. d. Abdomen. e. Uropod. f. Chela. g. Carapace from side. h. Carapace of first young crab from megalopa.

measured 0.9 mm. in length, and was green with much black. It is very like *Planes* and of the same type but is smaller and has a shorter and straighter dorsal spine. Cano (1891) describes and Hyman (1922) quotes his description of the zoeae and megalopa of *Pachygrapsus marmoratus* which in appear-

ance is very like the present species. It differs however in the telson and in having no knobs on the third abdominal somite. Two megalopae are described as belonging to *P. marmoratus*, but one cannot be certain if these really were two stages as no moults were obtained. Only one megalopa stage was

ound in the Plymouth Brachyura (Lebour, 1928) but several workers have stated that two occur from other parts of the world and Aikawa (1937) notes them in *Plagusia*.

Goniopsis cruentatus (Latreille).

The Mangrove Crab is very common in rock crevices above but near water. Two females were obtained in berry, Aug. 29, 1938, from rocks around the fish-pond in the station grounds. This pond is connected with the sea. The eggs were dark brown, appearing black in bulk, and measured 0.32 mm. across. Unfortunately they did not hatch, as it was difficult to keep them alive.

Percnon gibbesii (Milne Edwards).

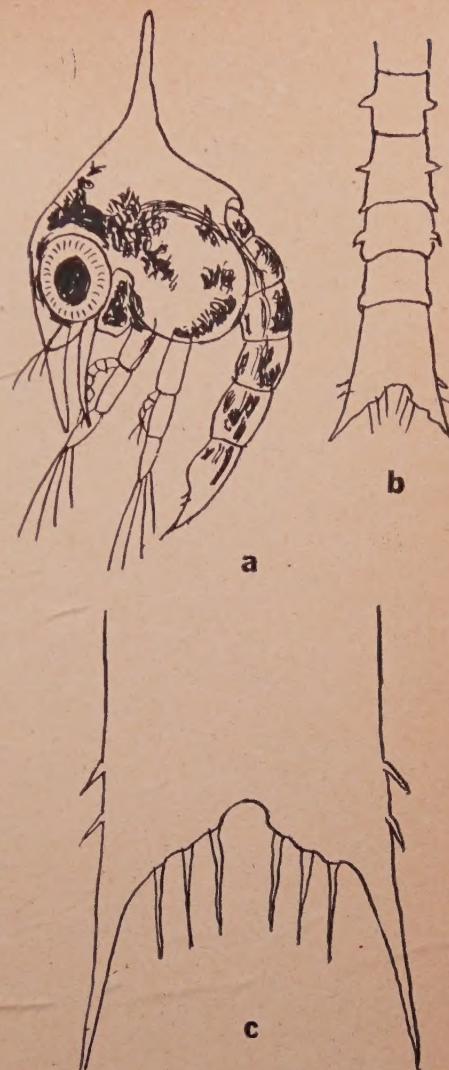
(Text-fig. 6).

This crab is common under stones on the south shore of Long Bird Island and on the other islands near. It runs very fast when disturbed and usually lives very near high water mark. It was in berry in July and some eggs were hatched July 15, 1938, but the zoeae died and the color was not noted. The eggs were bright red and measured 0.36 mm. across. The first zoea measured 1.9 mm. in length. It differs very much from *Planes* and *Pachygrapsus* but is somewhat similar to *Plagusia dentipes* described by Aikawa (1937), although differing in several points. Thus they both have lateral spines on the carapace but the antenna differs and there are knobs on abdominal somites 2-4 in *Plagusia* as there are in *Planes* and *Pachygrapsus*, while in *Percnon* they are only on 2 and 3. The telson in both *Plagusia* and *Percnon* has no lateral spine, while in *Planes* and *Pachygrapsus* there are 2. *Percnon* differs from all zoeae so far known in having the posterior part of the carapace bent up to form a flange on each side. The antenna has a minute unarmed knob representing the exopod. There is a very large and swollen anal papilla.

A megalopa of this species found by Mr. John Armstrong of Harvard University among rocks on Cooper's Island is interesting as it is very large, the carapace measuring 5 mm. in length. It has the abdomen stretched and the uropods of a typical megalopa armed with 22 setae, but the last 3 end in denticulate dactyls without any spines, thus resembling a Spider Crab. There are 3 large teeth in front of the carapace and the walking legs are very long. It is possible that this is a megalopa in the second stage.

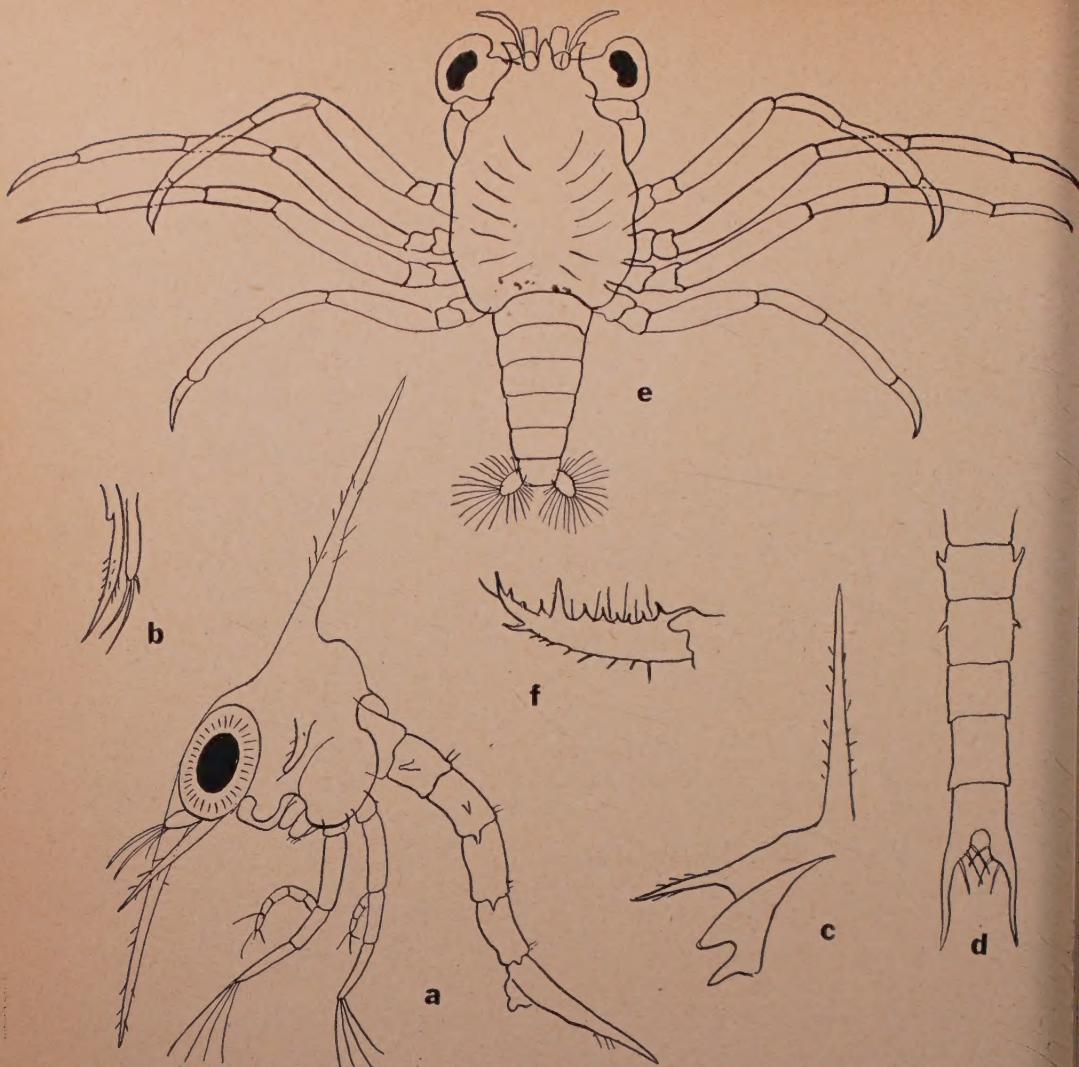
XANTHIDAE.

Gurney (1938 a) discusses the known seae of the family and shows that the characters used for the grouping of these (antennal exopod, lateral spines on the telson and spines on the carapace) do not corre-



TEXT-FIG. 5. *Pachygrapsus transversus*. a. Side view of first zoea, 0.9 mm. long. b. Abdomen and telson. c. Telson.

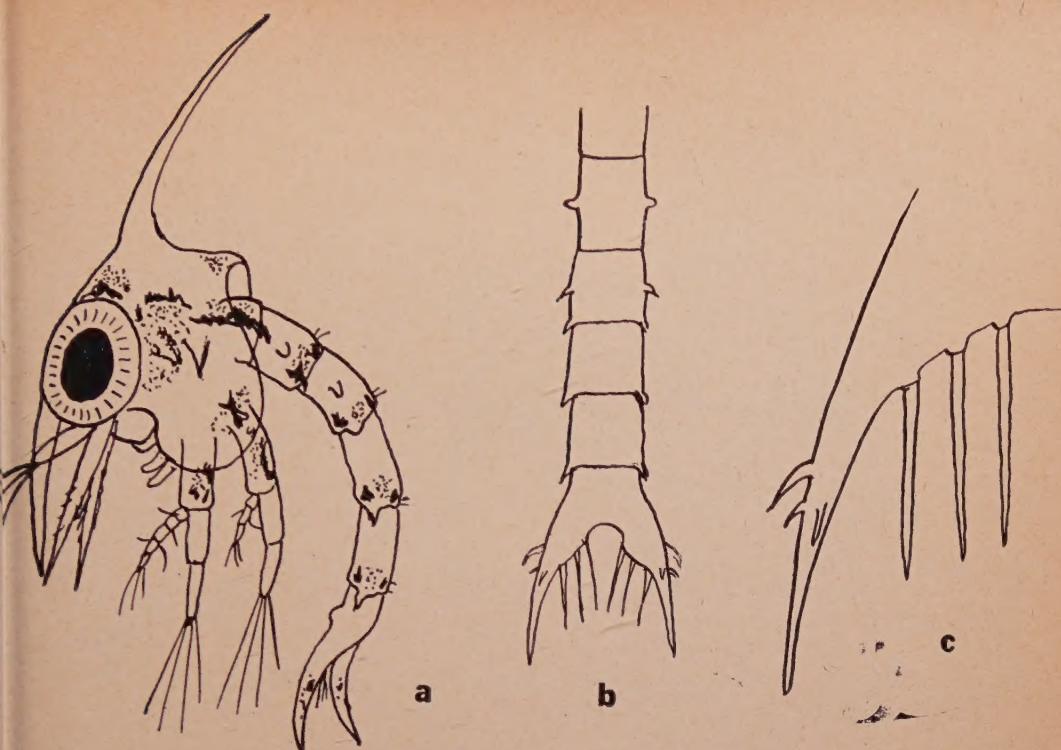
spond with the present arrangement of the adults. Three more zoeae from Bermuda can now be added to this list (Gurney, 1936 d, having already described the first zoeae of *Heteractaea ceratopus*)—*Panopeus bermudensis*, *Leptodius parvulus* and *Xanthodius denticulatus*. Of these the first two have the antennal exopod as long as the spine and the third has a short exopod with 2 terminal setae and appears to be a typical zoea of the sub-family Xanthinae. There are six known zoeae of this family which have the antennal exopod as long as, or very nearly as long as, the spine and no terminal setae. These are *Pilumnus hirtellus* (described by Lebour, 1928), *P. minutus* and *P. vespertilio* (described by Aikawa, 1929), *Panopeus ber-*



TEXT-FIG. 6. *Percnon gibbesii*. a. Side view of zoea, 1.9 mm. long. b. Antennule and antenna. c. Posterior end of carapace. d. Abdomen and telson. e. Megalopa. f. End of last leg.

mudensis and *Leptodius parvulus* (described here) and *Heteropanope glabra* (described by Aikawa, 1929). Cano (1892 c) describes three species of *Pilumnus* including *P. hirtellus* but does not differentiate between them. These are quoted by Hyman (1925) and are all of the same type as *hirtellus*. The *Pilumnus* species (excepting those of Cano) were all hatched from the egg and agree except for the fact that *P. minutus* has only 2 lateral spines on the telson instead of 3. They all have 3 kinds of spines on the carapace. *Leptodius parvulus* agrees with *Pilumnus hirtellus*. *Heteropanope glabra* lacks the dorsal and rostral spines on the carapace and has only one lateral spine on the telson. *Panopeus bermudensis* comes

between the *Pilumnus* species and *Heteropanope glabra*, having very short rostral and lateral spines on the carapace, as in *Pilumnus minutus*, but agreeing with *Heteropanope glabra* in having only one lateral spine on the telson. These 6 species seem to form a group characterized by the antenna as opposed to all the remaining zoeae known in the family which have the exopod shorter than the spine, either vestigial or with terminal setae. As Gurney (1938 a) points out, the difference between the zoeae of *Heteropanope glabra* and *H. tridentata* (the latter described by Tesch, 1922) is so striking that if the description and parentage are correct any classification according to larval characters on these lines is upset.



TEXT-FIG. 7. *Leptodius parvulus*. a. Side view of first zoea, 1.12 mm. long. b. Abdomen and telson. c. Telson.

***Leptodius parvulus* (Fab.) Rathbun.**
(Text-fig. 7).

The zoea is of the *Pilumnus* type but in form and color is very like that of *Xanthodius denticulatus* described below. This species is common in rocks and under stones between tide-marks on the south shore of Long Bird Island. In berry in June. The eggs were hatched July 2, 1938, and were brown, 0.32 mm. across. The newly hatched zoea measures 1.12 mm. in length. It is a pale grayish-blue all over; it is not transparent as *Xanthodius denticulatus*, with rather more red and black pigment, which besides being on the thorax and abdomen also occurs on the maxillipeds and spines of the telson. There are dorsal, rostral and lateral spines on the carapace, all well developed, the dorsal and rostral being long. There are 3 lateral spines on the telson and knobs on abdominal somites 1 and 2. The antennal exopod is as long as the spine and has no terminal setae.

***Panopeus bermudensis* Benedict & Rathbun.**
(Text-fig. 9).

This species was dredged off the north shore of Long Bird Island and was in berry June 10, 1938. The eggs measured 0.32 mm., very red. They were hatched June 14. The

newly hatched zoea, 1.4 mm. long, is greenish with black chromatophores and at first sight looks very like *Planes minutus* and *Pachygrapsus transversus*. It is peculiar and unlike other xanthid zoeae in having spine-like knobs on the fourth and fifth abdominal somites as well as on the second and third. There are denticulations postero-laterally on the carapace and only one lateral spine on the telson. The antennal exopod is as long as the spine.

***Panopeus occidentalis* Saussure.**

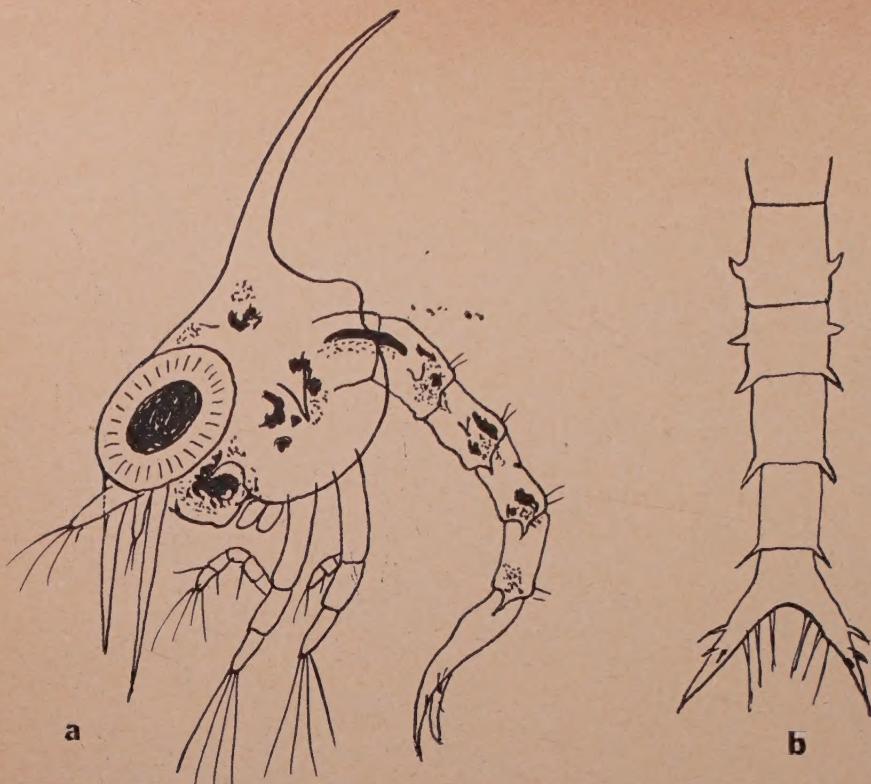
From Spanish Point. In berry Aug. 11, 1938. The eggs were black, 0.32 mm. across. The crab died and the eggs were not hatched.

***Micropanope spinifer* Milne Edwards.**

From a rock crevice on the south shore of Long Bird Island. In berry June 20, 1938. The eggs were dark red, 0.32 mm. across. The crab died and the eggs did not hatch.

***Xanthodius denticulatus* (White) Rathbun.**
(Text-fig. 8).

This crab was obtained fairly commonly on the south shore of Long Bird Island and was in berry in July. The eggs were hatched out July 24 and July 26, 1938, and measured



TEXT-FIG. 8. *Xanthodius denticulatus*. a. Side view of first zoea, 1.3 mm. long. b. Abdomen and telson.

0.34 mm. across when ready to hatch. The newly hatched zoea measured 1.3 mm. in length and was very transparent with black and red chromatophores on the thorax and abdominal somites and in the region of the mandible. The antennal exopod is about a quarter the length of the spine, with 2 terminal setae. The dorsal and rostral spines are fairly long and of about equal length, the lateral spines short. The telson has the usual 3 outer spines. There are lateral spines on abdominal somites 3-5 and lateral knobs on 2-3. This appears to be of the *Xanthodius* type.

OXYRHYNCHA.

MAJIDAE.

The crabs hatched out belong to the subfamilies Acanthonychinae: *Acanthonyx petiverii*, and Majinae: *Mithrax forceps* and *Microphrys bicornutus*. The zoea of the first is like that of *Acanthonyx lunula* described by Cano (1893 b) and Boraschi (1921), the other two come between the *Pisa* type of zoea (Lebour, 1931 c) and that of *Maia* (Lebour, 1927 and 1928 b).

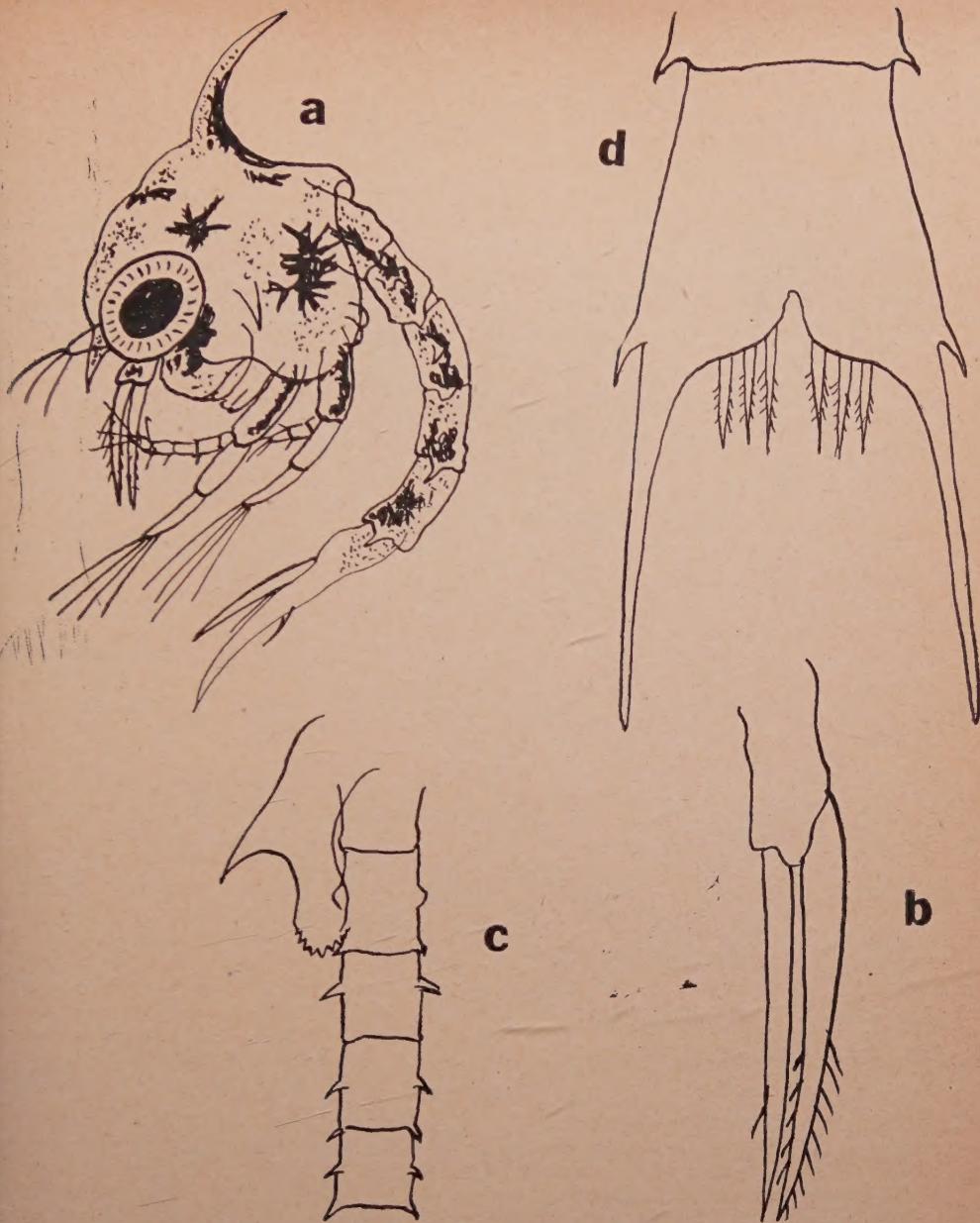
Acanthonyx petiverii Milne Edwards.
(Text-fig. 10).

These crabs are abundant, living among

seaweeds (including *Fucus*) in rocky pools around Cooper's Island and one was dredged in sand just outside it. I am indebted to Dr. F. A. Chace, Jr., for its identification. The seaweed appears to be the natural habitat as they have pieces of the weed on the rostrum and sometimes about the body and closely resemble the weed itself. This is a new record for Bermuda. Females in berry were obtained in April and the zoeae hatched out May 2, 1939. The newly hatched zoea measures 1.8 mm. in length and corresponds in form with that of *Acanthonyx* described by Cano (1893 b), having a short dorsal spine, a very short rostral spine and no lateral spines, no lateral spines on the telson and the antennal exopod as long as, or slightly longer than, the spine, with no terminal setae, but 2 setae near the tip. There are knobs on the second abdominal somite. The body is a pale pinkish-brown with much black pigment, especially in the thorax and ventrally on each abdominal somite. The early eggs were golden yellow, 0.56 mm. across, the later eggs slightly larger and appearing black in the mass.

Epialtus bituberculatus Milne Edwards.

This crab was dredged from sand off Cooper's Island with *Acanthonyx* and was also obtained by Dr. Klitemann in Hungry



TEXT-FIG. 9. *Panopeus bermudensis*. a. Side view of first zoea, 1.4 mm. long. b. Antenna. c. Abdomen. d. Telson.

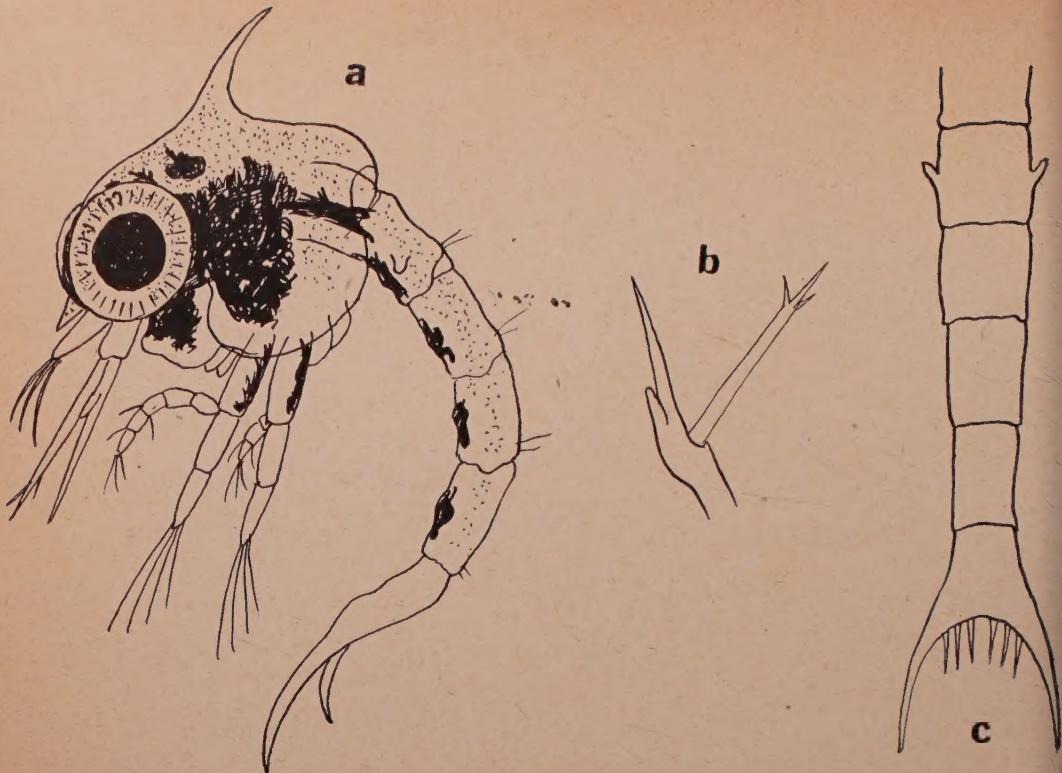
Bay, in berry, both in April. Unfortunately the eggs did not hatch, as the crabs died. The eggs are few and large, 0.72 mm. across, inky with a bright orange-red yolk.

***Mithrax forceps* Milne Edwards.**

(Text-fig. 11).

This crab occurred not uncommonly on the south shore of Long Bird Island and Tobacco Bay near St. Georges, in rocks between tide-marks. In berry in July. The

eggs hatched July 6, 1938, and were 0.64 mm. across and dark brown. The newly hatched zoea measured 1.8 mm. in length. The dorsal spine is short, the rostral very short, and there are no lateral spines. There is one lateral spine on the telson, the forks of which bear spinules, and there is a pair of lateral knobs on the second abdominal somite. The antennal exopodite is not quite as long as the spine and bears 3 terminal setae. There are lateral spines on the third, fourth and fifth abdominal



TEXT-FIG. 10. *Acanthonyx petiverii*. a. Side view of first zoea, 1.8 mm. long. b. Antenna. c. Abdomen and telson.

somites. Thus in the type of antenna it resembles *Maia* but in most of its other features it is more like *Pisa*. The color is pale yellowish with pink on the abdomen and on the maxillipedes, black in the thorax and in patches on the abdominal somites.

***Microphrys bicornutus* (Latreille).**

(Text-fig. 12).

This crab is common under stones along the shore between tide-marks and was obtained from the north and south shores of Long Bird Island and from a sandy bay on St. David's Island. In berry June and July. The eggs, 0.48 mm. across and dark brown, were hatched June 29, 1938. The zoea is very like that of *Mithrax* but the eyes are much larger and of a peculiarly vivid blue. The dorsal spine is short, the rostral very short, even shorter than that of *Mithrax*, and there are no lateral spines. There is one lateral spine on the telson, and the forks bear spinules. There are lateral knobs on the second abdominal somite and somites 3-5 have lateral spines. The antenna is like *Mithrax* except that the exopod is shorter in proportion to the spine. The body is a transparent yellow with red chromatophores behind the carapace and at the base of the second maxillipede and black on the

thorax in patches and ventrally on the abdominal somites. The first zoea changed to the second (last) in a small glass bowl. It is very little larger than the first, but the pleopods are very long and there are 6 setae on the maxillipedes.

PARTHENOPIDAE.

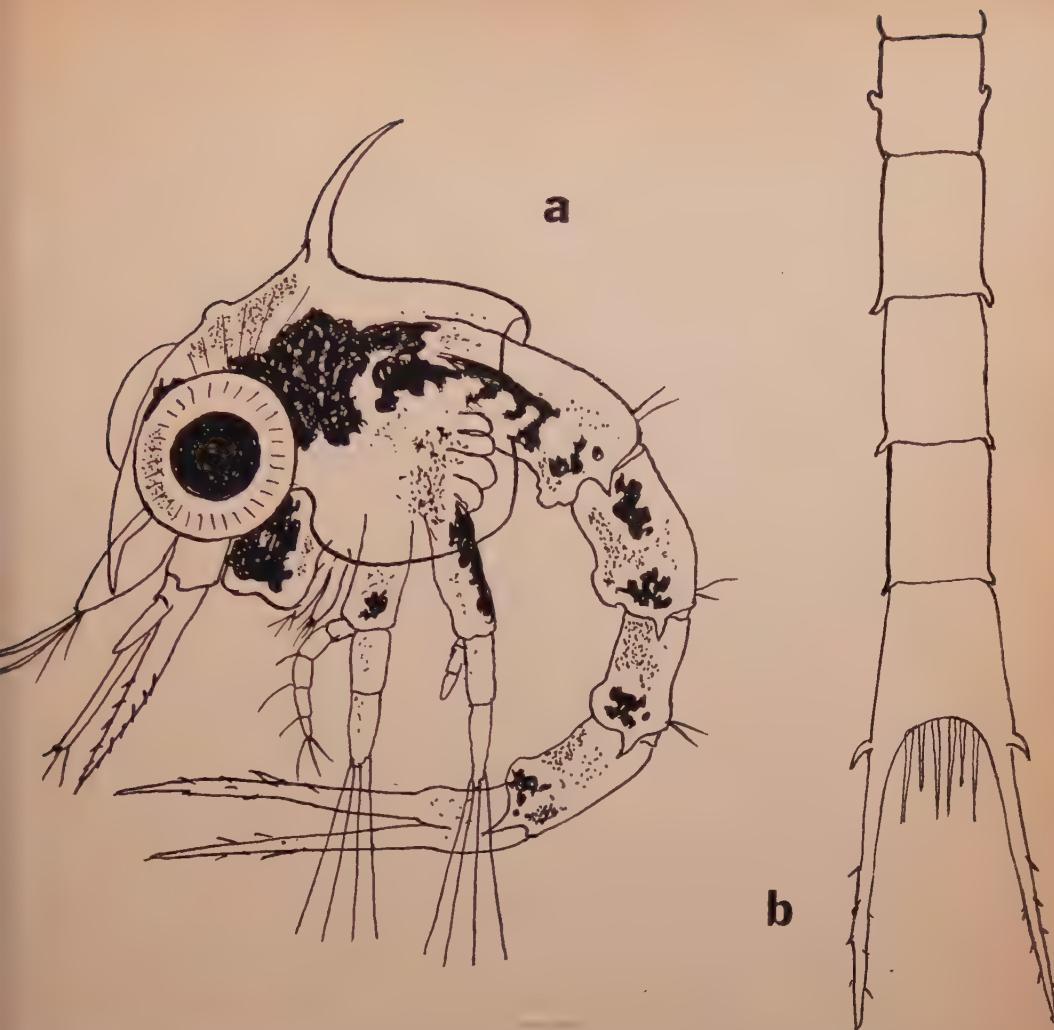
(Text-fig. 13).

The megalopa of a species of *Parthenope* was occasionally taken in the outside tow-nets. This had a characteristic form with very long chelae. The carapace, including rostrum, measured 3.5 mm. in length. There is a long dorsal and a long rostral spine, the abdominal somites 3-5 have lateral spines and the uropods bear numerous setae (exact number not ascertained). As is found in all the known megalopae of the Oxyrhyncha, there are no feelers on the dactyl of the last leg, but this is armed with teeth and hairs.

OXYSTOMATA.

LEUCOSIIDAE.

Several undetermined zoeae of *Ebalia*-like form were obtained in the outside tow-nets, one of which was occasionally abundant. Three species, A, B and C, were distin-



TEXT-FIG. 11. *Mithrax forceps*. a. Side view of first zoea, 1.8 mm. long. b. Abdomen and telson.

ushed. All of them had much black pigment on the body.

Species A (Text-fig. 14). This was much the commonest. There was much heavy black pigment in the thoracic region. There are long dorsal and rostral spines and fairly conspicuous lateral spines. The second and third abdominal somites have lateral knobs and the telson has one lateral tooth near the angle. The first zoea measured 0.80 mm. in length; the third, which had 6 setae on the maxillipeds, and fairly conspicuous pleopods, measured 1.9 mm., and the fourth (last) measured 3 mm. The last had 8 setae on the maxillipeds and very long pleopods.

Species B (Text-fig. 15). Has a fairly long dorsal spine (broken in the figure), a short rostral spine and no lateral spines. This measured ca. 2.2 mm. in length in the last stage. The telson is similar to A.

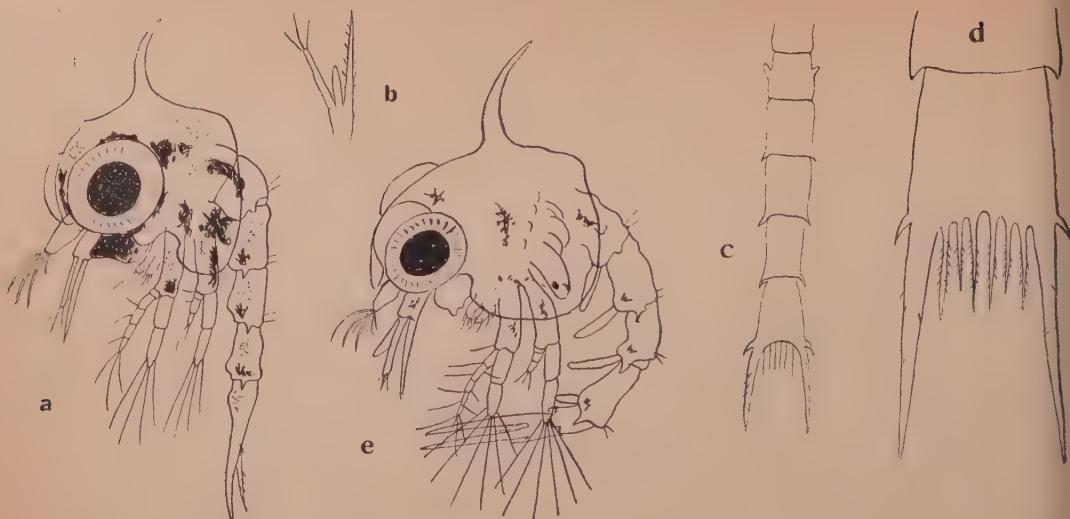
Species C (Text-fig. 16). Measured 2.2 mm. in length in the second stage and is like B but with a longer rostral spine and no outer spine to the telson.

It is worth while recording these forms, as species belonging to this family are extremely rare in Bermuda and probably several have yet to be found there.

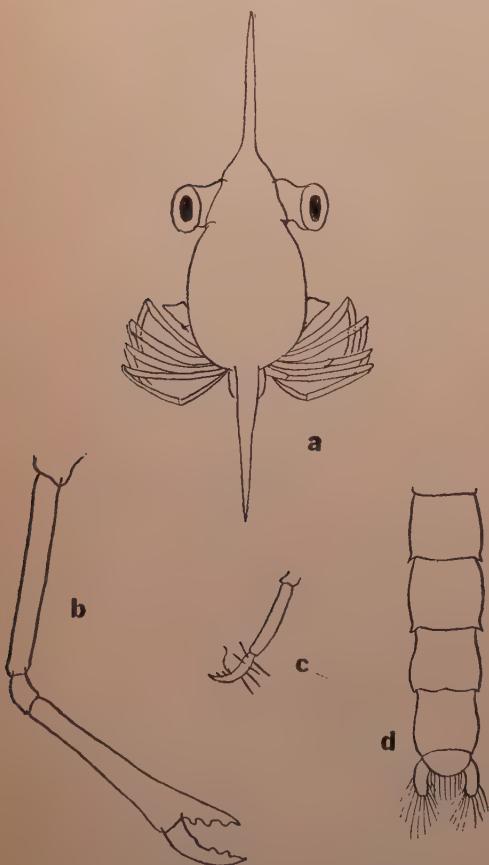
CALAPPIDAE.

Calappa flammæa (Herbst).
(Text-fig. 17).

The megalopæ of this species have already been described by Smith (1880 b, as *Calappa marmorata*), but not figured. They are found occasionally on the outside tow-nets and swimming at the surface in the shallow water of the Reach at night, the adult being common around the coasts. A



TEXT-FIG. 12. *Microphrys bicornutus*. a. Side view of first zoea, 1.7 mm. long. b. Antenna. c. Abdomen and telson. d. Telson. e. Side view of second zoea.



TEXT-FIG. 13. *Parthenope* sp. a. Megalopa carapace, 3.5 mm. long. b. Chela. c. End of last leg. d. Abdomen and telson.

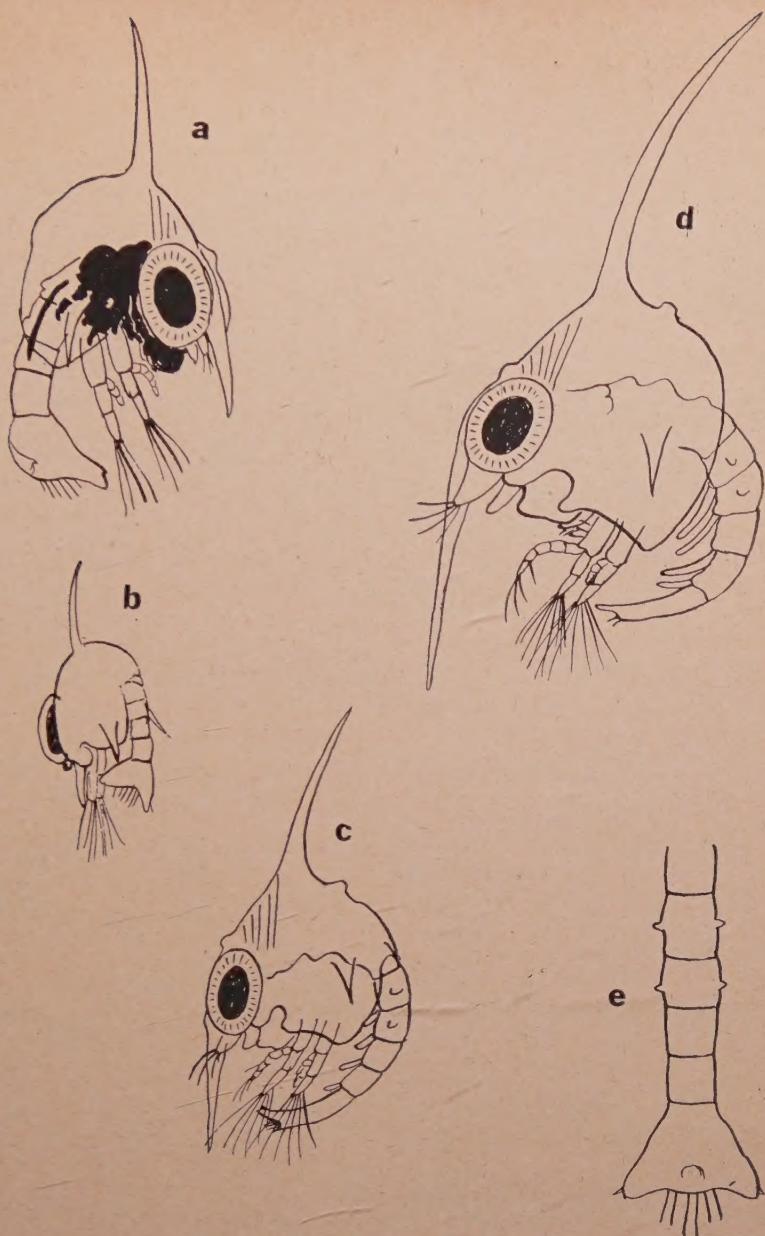
peculiar and striking feature of this megalopa, not noted by Smith, is the presence of very large oil-like spherical globules in the thoracic region, always 12 in number. Although they may be arranged in a slightly different manner they are always symmetrically placed. The body is a pale yellowish all over. There are 20 setae on the uropods, and, as Smith has pointed out, there are 3 feelers on the end of the dactyl of the last leg. This changed to a young crab, June 21, 1938. The carapace measured 4.2 mm. across. The specimen died and was slightly damaged, therefore the drawing shows the carapace distorted. A specimen from deeper water, presumably the same species, differs slightly from the others (Text-fig. 18).

***Cycloës bairdii* Stimpson.**
(Text-fig. 19).

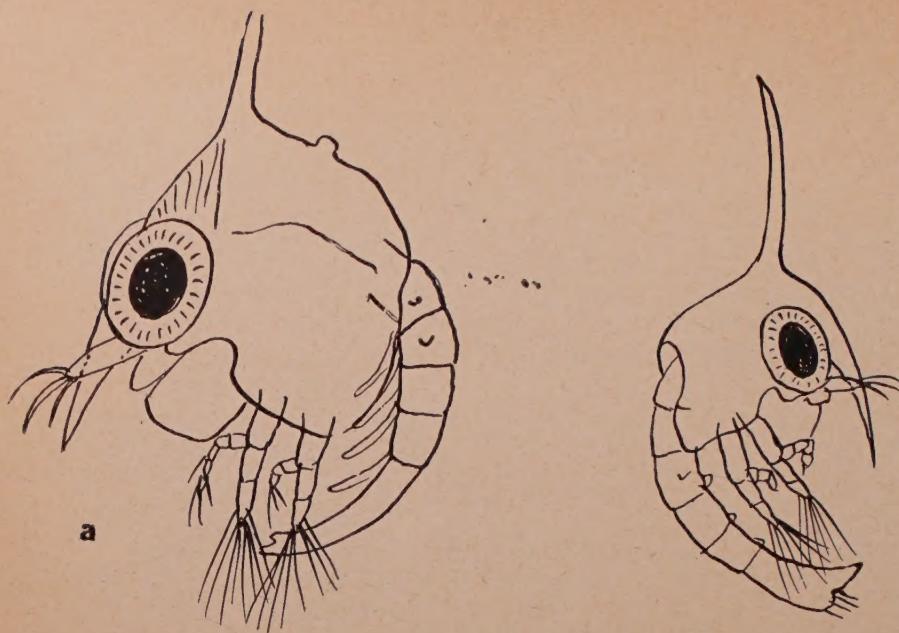
The megalopa, hitherto undescribed, of this species, which in many ways resembles that of *Calappa*, was obtained occasionally in the outside tow-nets. It is pale yellow all over with small red spots. The carapace measured 3 mm. long and is rather narrower than that of *Calappa*. There are here also large globules in the thorax but there are 14 of them. The last leg ends in 3 feelers. The uropods bear 17 setae. There are tubercles on the dactyl of the chela and along the propodus. This changed to a young crab which has a very round carapace, measuring 3 mm. in length. The chelae are of the characteristic shape of the adult.

BIBLIOGRAPHY.

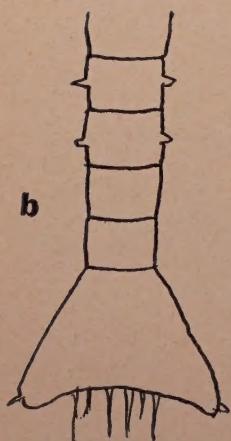
The literature is all referred to Gurney's Bibliography of the Larvae of Decapod Crustacea. 1939. Ray Society.



TEXT-FIG. 14. *Ebalia*-like zoea A. a. Side view of Species A, 0.8 mm. long. b. Back oblique view. c. Stage 3. d. Stage 4 (last). e. Abdomen and telson of stage 4.



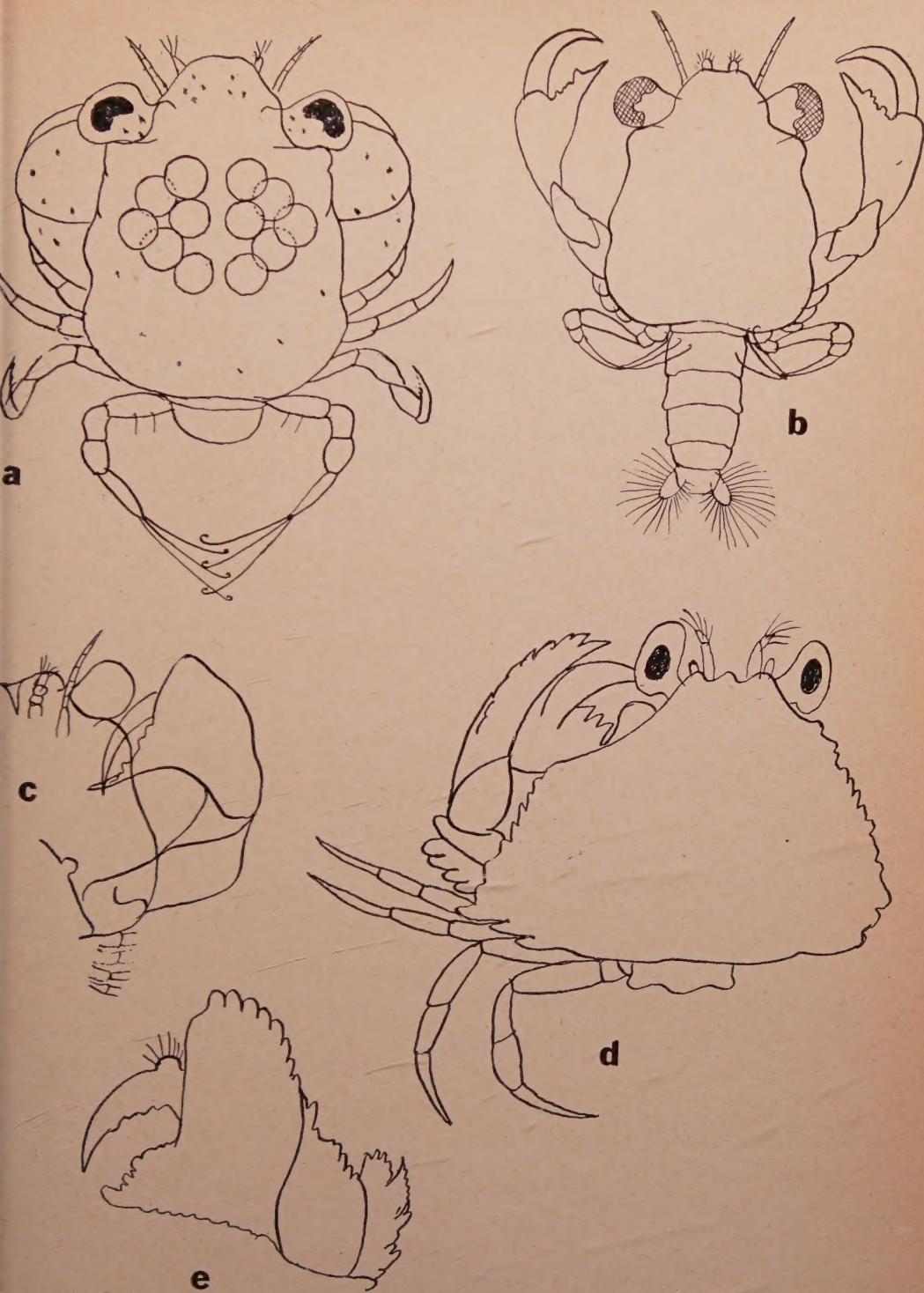
TEXT-FIG. 16. *Ebalia*-like zoea C, second (?) stage, 1.5 mm. long.



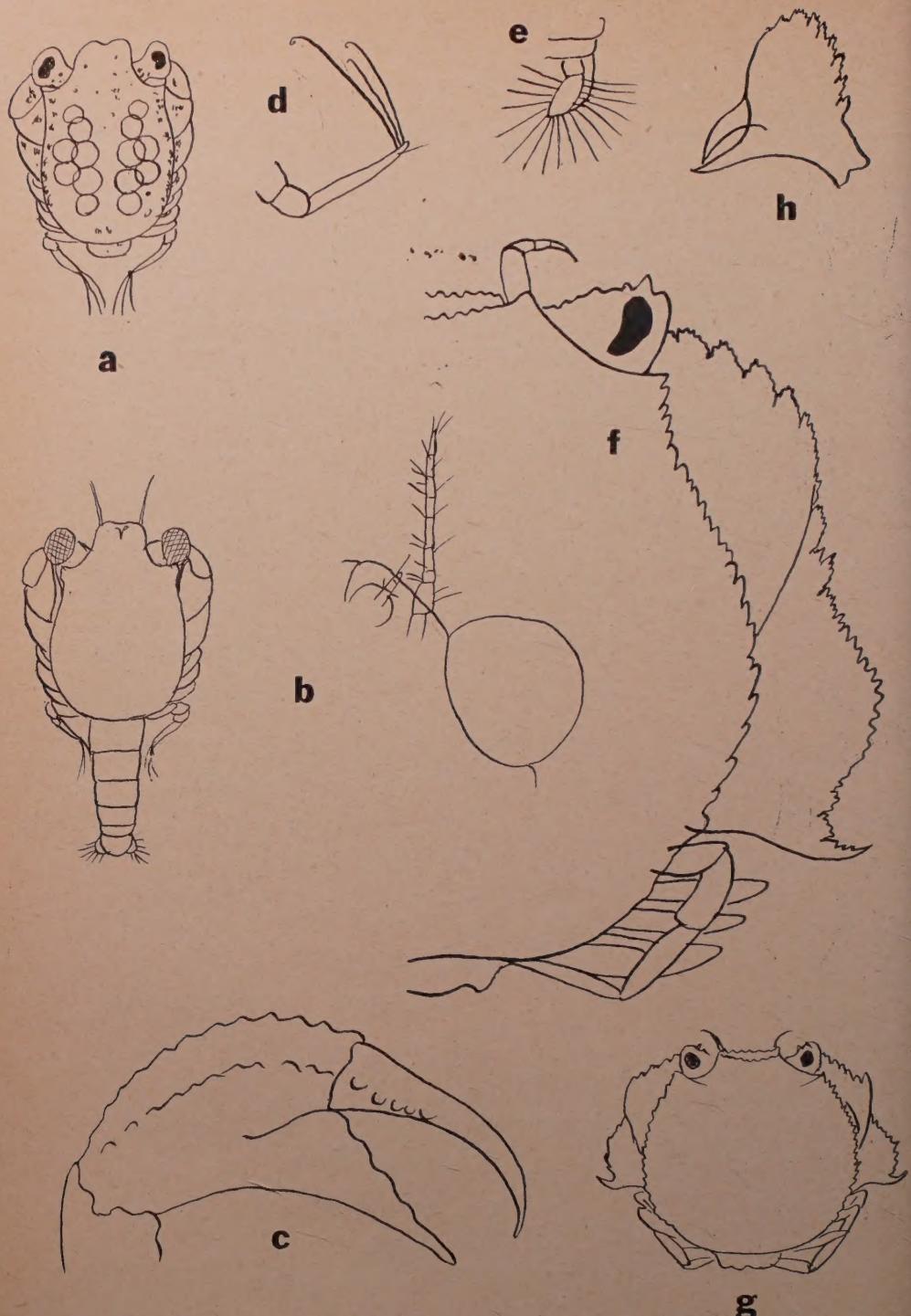
TEXT-FIG. 15 *Ebalia*-like zoea B. **a.** Side view of last stage, 2.2 mm. long. **b.** Abdomen and telson.



TEXT-FIG. 18. Rough sketch of another megalopa from deeper water.



TEXT-FIG. 17. *Calappa flammee*. a. Megalopa, 4.5 mm. long. b. Cast megalopa, dorsal. c. Cast megalopa, ventral. d. First crab from megalopa, carapace 4.2 mm. long. e. Chela.



TEXT-FIG. 19. *Cycloës bairdii*. a. Megalopa, carapace 3 mm. long. b. Cast megalopa. c. Chela. d. End of last leg. e. Telson and uropod. f. g. First crab from megalopa, 3 mm long. h. A chela.